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1. Introduction

1.1 Scope and Purpose

This manual is intended to support authorized Webasto trained distributors, dealers and personnel in the installation and servicing of the Air Top 5000 air heater.

Webasto Product North America, Inc. does not recommend the installation and servicing of Webasto products by untrained, unauthorized personnel or end-users.

Installations and servicing of Webasto products by untrained, unauthorized personnel and end-users will release Webasto Product North America, Inc. and Webasto authorized distributors, dealers and personnel from responsibility for damage to Webasto product or collateral property and personal injury.

Any use, operation, installation, modification or application of the product not described in Webasto manuals, or subjecting the product to extreme or unusual conditions beyond the limits of specified performance characteristics is misuse of the product.

The heater installation must be performed in accordance with the installation instructions within this manual.

Failure to comply with all installation instructions is a misuse of Webasto product. The same applies for repairs without using genuine Webasto service parts. This will void the air heaters "Official Marks of Conformity."

1.2 Meaning of Warning, Caution, and Attention Headings

Warning, Caution and Attention headings in this manual have the following meaning:

⚠WARNING
This heading is used to highlight that non-compliance with instructions or procedures can result in serious injuries or death to personnel.

⚠CAUTION
This heading is used to highlight that non-compliance with instructions or procedures may cause damage to equipment.

ATTENTION!
This heading is used to highlight and draw specific attention to important information.

1.3 Additional Documentation to be Used

This manual contains all of the information and procedures necessary for the installation of the Air Top 5000 heater in on and off highway vehicles.

The use of additional documentation is normally not required. Vehicle specific installation guides (when available) may be used as complementary information only.

1.4 General Safety Regulations and Information

The general safety regulations for the prevention of accidents and relevant operating safety instructions must be observed at all times.

The specific safety regulations applicable to this manual are highlighted in the individual chapters by Warning, Caution and Attention notations (see section 1.2).

1.4.1 General Safety Notes

The Air Top 5000 heater is approved for installation in the passenger compartment and the driver's cab, not however, the cargo space for the transportation of hazardous materials.

In the case of buses, the heater must not be installed in the driver's compartment nor in the passenger area. Nevertheless, should the heater be installed in such areas, the installation housing must be sealed tight against the vehicle interior. The installation housing must be provided with adequate external ventilation in order not to exceed a maximum temperature of 40 °C (104 °C) inside the housing. If this temperature is exceeded, malfunctions are likely to occur.

⚠WARNING
Due to the risk of carbon monoxide poisoning causing death or serious injury to personnel, the heater must not be operated in enclosed areas, such as garages or workshops, without an exhaust venting system, not even if the start-up is activated by the timer or remote start device.

At filling stations and fuel depots the heater must be switched off as there is a potential danger of explosions.

Where flammable fumes or dust may build up (e.g. in the vicinity of fuel, coal, wood, cereal grain deposits or similar situations) the heater must be switched off to prevent explosions.

In the vicinity of the Air Top 5000 air heater, a temperature of 185 °F (85 °C) must not be exceeded under any circumstances (e.g. during body paint work). A violation of this temperature limit may cause permanent damage to the electronics.

Extracting combustion air from the vehicle interior is not permissible under any circumstance.

Exhaust pipes must be routed so that exhaust fumes will not penetrate into the vehicle's interior. Condensation accumulation in the exhaust line must be directly drained. A condensation drain hole is to be provided if required.

Do not route exhaust pipes and components within 50 mm (2 inches) of flammable materials such as polyurethane or similar foam insulation, styrene sheet insulation, fuel tanks and containers, glycol reservoirs, coolant lines, wood and paper products, carpet, tires, electrical wiring, brake and air lines or any materials deemed to be flammable or heat sensitive.

Do not terminate exhaust above flammable materials such as polyurethane or similar foam, insulation, styrene sheet insulation, fuel tanks and containers, glycol reservoirs, coolant lines, wood and paper products, carpet, tires, electrical wiring, brake and air lines or any materials deemed to be flammable or heat sensitive.

The function of any parts vital for vehicle operation must not be impaired.

Electrical lines, switch gear, and control gear of the heater must be located in the vehicle so that their proper function cannot be impaired under normal operating conditions.

The operational state of the heater, i.e. an indication "on" or "off", must be clearly visible to the operator. The Air Top 5000 Air heater may only be operated within the specified operating voltage range designated by type.

The fuel specified by the vehicle manufacturer for use in the engine is suitable fuel for use in the Air Top 5000 air heater.

- Air Top 5000D - Diesel 1, Diesel 2, Arctic grade, Kerosene and certain military spec. fuels.
- Air Top 5000B - Gasoline (all grades).

When the fuel for the heater is drawn from the vehicle fuel tank, the vehicle manufacturer's specifications concerning additives are to be observed. Any addition of waste oil is not permitted.

When changing to cold-resistant fuels, the heater must be operated for approx. 15 minutes to ensure that the fuel metering pump is filled with the new fuel.

For the routing of fuel lines, the following important regulations must be adhered to:

1. Fuel lines are to be installed in such a way that they remain unaffected by torsional stresses created by vehicle movement. They must be protected against mechanical damage.

2. Fuel lines must be securely fastened to the vehicle every 30 cm. (12 inches) or less along the total length from heater to fuel tank.

3. Fuel-carrying parts are to be protected against excessive heat and are to be installed so that any dripping or evaporating fuel can neither accumulate nor be ignited by hot components or electrical equipment.

4. Fuel supply must not be by means of gravity or pressurization of the fuel tank.

5. The fuel tank must either be equipped with a vent cap or be ventilated in another way (ventilation line).

2. General Description

2.1 General Description

World class technology with ease of installation, maintenance and operation has made the Air Top 5000 heater a popular choice among fleets, drivers and technicians.

The Webasto Air Top 5000 heater is designed to be used on any gasoline / diesel equipped vehicle, including trailers, vans, buses, boats, van bodies, construction, off-road and military equipment, generators and as independent heating systems.

Fig. 2-1: Webasto Air Top 5000 Air Heater

Webasto air heaters for the following applications:

1. Cargo Heating: The Air Top 5000 can be used an as independent heating system to protect temperature sensitive / valuable products from freezing (produce, beverages, etc.). Webasto cargo kits are supplied with an installation instruction supplement to cover the specific requirements of this application.
2. Marine: The Air Top 5000 can be used as the primary heating source for watercraft. Boat installations may only be performed by a Webasto authorized marine dealer. It is the authorized marine dealer's responsibility that the installation complies with all applicable Coast Guard regulations. Webasto Product North America, Inc. can provide you with information concerning watercraft installations, and a selection of Marine dealers to serve your needs. Call 1-800-555-4518 for assistance.

3. Functional Description

⚠WARNING

Due to the risk of carbon monoxide poisoning causing death or serious injury, the heater must never be operated in closed spaces such as garages and workshops without adequate exhaust extraction.

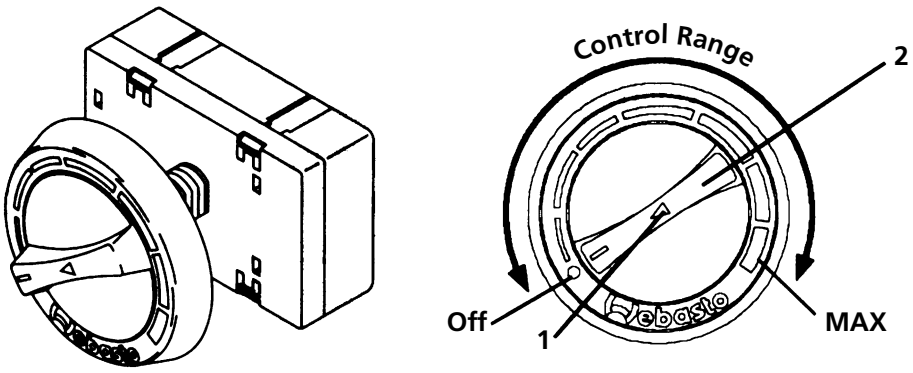
⚠WARNING

Due to the risk of fire or explosion causing death or serious injury to personnel, the heater must be switched off while refueling and at fueling stations.

⚠WARNING

Due to the risk of explosion causing death or serious injury to personnel, the heater must never be operated in areas where explosive materials, fumes or dusts may be present.

3.1 Operating the Air Top 5000 with Self Diagnostic Control Unit



1. Operation Indicator / Overheating Indicator
2. Rotary Knob On/Off
   - for turning on/off
   - for setting the desired room temperature
   - for deactivating fault lock-out

Fig. 3-1: Heater Control Element

3.1.1 Heater Control Element

The heater control element is used to switch the heater on and off, set the desired room temperature [intake temperature between 10 °C and 45 °C (50 °F and 113 °F)] and to reset the heater after a malfunction with error lockout.

The integrated green LED indicator is used as
- operating indicator light (LED is continuously illuminated)
- malfunction code/overheat indicator (LED flashes)

For more information concerning malfunction and flash codes, see section 6.2 Troubleshooting.

3.1.2 Switch-On

The heater control element (fig.3-1) is used to switch the heater on and off, as well as setting the desired temperature. The control element acts as a thermostat, similar to a dimmer switch. The built in light indicates heater operation status by illuminating while the heater is on. The indicator light also functions as a diagnostic indicator (flash code) in the event of a system interruption (see section 6.2 Troubleshooting).

ATTENTION!
Should the temperature of the intake air be above the selected, rated temperature, only the motor of the combustion and heating air fan will operate (control idle). Start operation will be initiated with a heating air temperature below the rated temperature.

Once the heater control element has been turned on, the light on the control element will illuminate, and the ceramic igniter (glow pin) is activated. The fan motor briefly spins at high speed, then slows down. After approximately 20 seconds, the fuel metering pump starts delivering fuel. After another 25 seconds, once combustion is established the fan speed starts to vary gradually. If within 2 minutes there is no stable combustion, the heater will purge for 30 seconds and then repeat the start up sequence. If the heater fails to start after the second attempt, it will enter into an "operation lockout" mode and shut itself down (see section 3.1.5 Switch-Off upon Malfunction).

3.1.3 Heating Operation

The heater will heat to the desired temperature setting and attempt to maintain it. For more heat, simply rotate the heater control element dial clockwise and counterclockwise to decrease heat level. A temperature sensor located inside the heater works in conjunction with the control element to deliver the desired amount of heat. Once the desired temperature has been reached, heat output is maintained automatically by increasing or reducing fan speed and fuel delivery.

ATTENTION!
New settings on the control element are executed by the control unit/heater with a time delay.

3.1.4 Switch-Off

Switching the heater off extinguishes the operation indicator of the control element.
If no fuel has been delivered or if the air heater is in control idle, the air heater is deactivated immediately without run-down.

If the fuel metering pump is operating, it will be immediately stopped at switch-off. Fan speed remains constant and then decreases within 30 seconds to approx. 60% of full speed. After the flame has extinguished, the fan speed rises to maximum speed for 60 seconds and run down for 120 seconds is initiated.

Run-down is at approx. 60% of full speed and is deactivated automatically.

ATTENTION!
Re-activation of the heater during run-down is permitted. Run-down will be completed first with a subsequent restart.

3.1.5 Switch-Off upon Malfunction

The control unit recognizes malfunctions of individual air heater components and malfunctions in the start sequence and in normal operation.

The air heater is deactivated and enters the error lockout mode under the following conditions:

- flame sensor resistance out of tolerance
- temperature sensor resistance out of tolerance
- glow pin/glow pin trigger defective
- fan speed too low, short circuit or open circuit
- error in metering pump electrical circuit or of overheat protection (in start phase only)
- low voltage below 10 Volt and in excess of 20 seconds for 12 Volt heaters
- low voltage below 20 Volt and in excess of 20 seconds for 24 Volt heaters
- control unit defective

In case of overheating there will be no fuel supply. A run-down like after manual switch-off will be performed. After run-down the control unit is in the error lockout mode. Overheating is indicated by the operation indicator flashing.

For error unlock, the air heater has to be switched off momentarily (at least 2 seconds) and to be switched on again.

For more information concerning malfunction and flash codes, see section 6.2 Troubleshooting.

3.2 7-Day Digital Timer Model 1531 with 3 Time-Settings and Temperature Selector

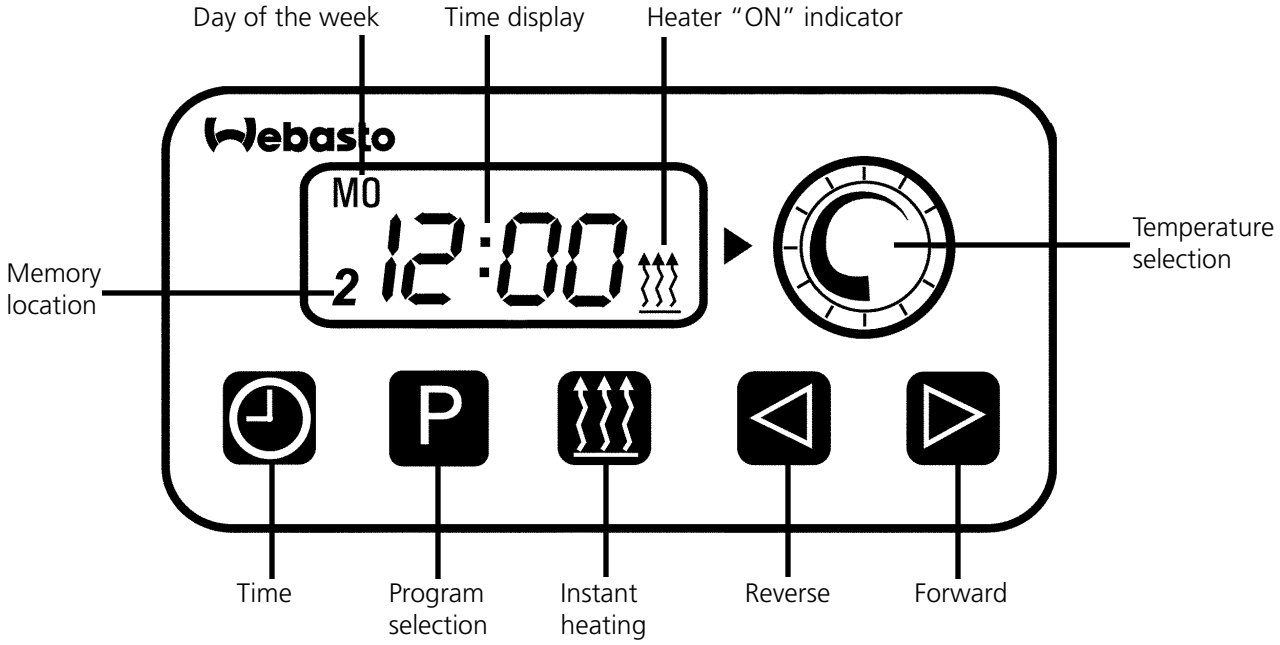


Fig. 3-2: 7-Day Digital Timer Model 1531 with Temperature Selection for Air Top 2000/3500/5000 Air Heaters Only.

General

The 7-day digital "Combination" timer enables you to preset the start of the heater operation up to 7 days in advance. It is possible to program 3 different starting times, only one of which can be activated. The combination timer has a temperature controller. The combination timer can only be used on Air Top 2000/3500/5000 air heaters which allow the temperature to be preselected.
When the ignition is switched on, the timer displays the current time and the day of the week. When the heater is switched on, the display and the buttons are illuminated.
After the power supply has been connected, all symbols on the display will flash. The current time and weekday must be set.

Operation

The timer can be operated in that all flashing symbols can be adjusted by means of the ◁ and ▷ buttons. If the buttons are not pressed within 5 seconds, the time displayed will be stored. If the ◁ and ▷ buttons are pressed for more than 2 seconds, the fast time-setting mode is activated. If the ignition is switched off while the heater is operating in the continuous mode, the remaining operating time of 15 minutes is displayed and the heater continues to operate for this period of time.

Air Top 2000/3500/5000

On heaters equipped with a fault diagnosis system (Air Top 2000/3500/5000), a number, i.e. the error code, may be flashing on the display. For more information concerning malfunction and error codes, see section 6.2 Troubleshooting.

Switching the heater on	Manually: by pressing the button (continuous heating mode). Automatically: by programming the heater starting time.
Switching the heater off	Manually: by pressing the button. Automatically: after the programmed operating time has elapsed. With the heater running: by programming the remaining operating time.
Setting the time and day of the week	Press the button for more than 2 seconds - time of the day is flashing - and set the clock using the ◁ or ▷ buttons. Wait 5 seconds. Time of day is now stored. Day of week is flashing - adjust the day of week using the ◁ or ▷ buttons. Wait 5 seconds. Day of week is now stored.
Viewing the time	Briefly press button. Display of current time and weekday appears for 5 seconds.
Programming heater starting time	Press P button - the memory location number is flashing - using the ◁ or ▷ buttons set start of heater operating time. Wait 5 seconds. Starting time is now stored. Day of the week is flashing - set the day of the week using the ◁ or ▷ buttons. Wait 5 seconds. Day of week is now stored. By repeatedly pressing the P button, memory locations 2 and 3 can be programmed or the time display mode can be reached.
Recalling/canceling preset times	Repeatedly press the P button until the desired memory location is displayed. To cancel the preset time, press the P button several times until the time of day is displayed instead of the memory location.
Programming duration of operating time	The heater must be switched off. Press the ◁ button for 3 seconds.- operating time is flashing - and set the desired operating time (10 to 120 minutes) using the ◁ or ▷ buttons.
Setting the remaining operating time	Heater must be in operation to set remaining operation time. Set the remaining operating time (1 to 120 minutes) using the ◁ and ▷ buttons. The remaining operating time refers to the time the heater still continues to remain in operation. It can only be changed while the heater is in operation and the ignition switched off.

Table 3-1: 7-Day Digital Timer Model 1531 Setting Instructions.

4. Technical Data

4.1 General Information

Unless tolerances are shown within the technical data table, a tolerance of ± 10% applies at an ambient temperature of +20 °C (+68 °F) and at the rated voltage and conditions.

Electrical Components:

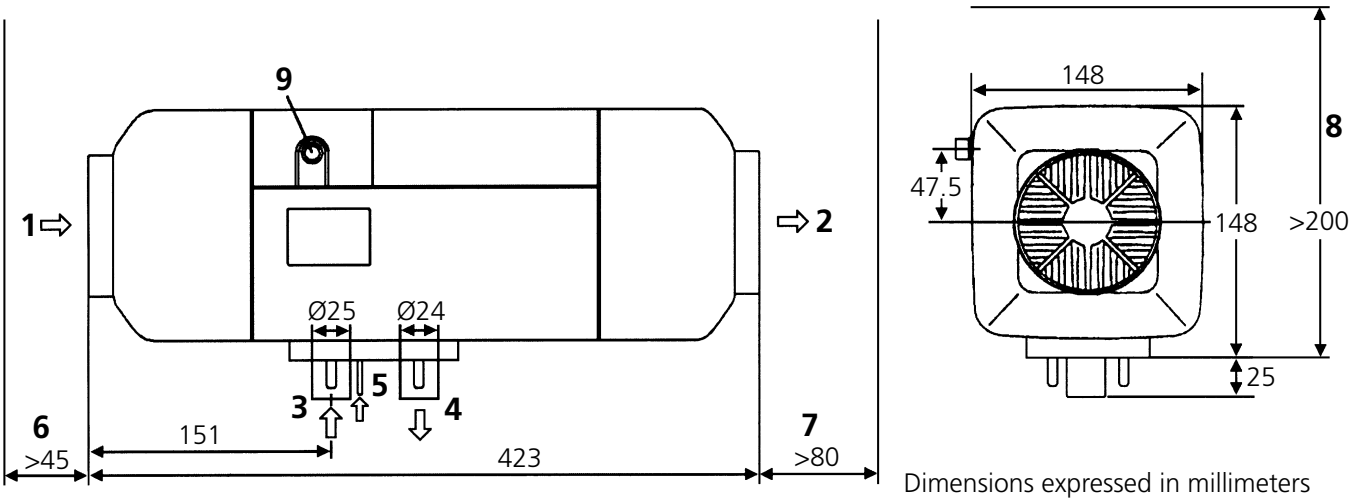
Control unit, motor, fuel metering pump, light bulb in the digital timer and pencil-type glow pin are designed either for 12-volt or 24-volt operation.
The digital timer, temperature limiter and flame detector are voltage-independent components.

Heater		**Air Top 5000 D**	**Air Top 5000 B**
Design Approval		~ S 303	~ S 304
Design		Air heater with evaporator burner (Ferro-Tec Technology)	
Heat Output:	Btu/hr (kW)		
	Boost	19,000 (5.5) (maximum 30 min.)	
Controlled Range:	From	5,100 (1.5)	
	To	17,100 (5.0)	
Fuel		Diesel #1 Diesel #2 and Arctic	Gasoline
Fuel Consumption	gal/hr (l/hr)		
	Boost	0.18 (0.66)	0.19 (0.73)
Controlled Range:	From	0.04 (0.17)	0.05 (0.19)
	To	0.17 (0.60)	0.18 (0.66)
Rated Voltage:	Volts	12 & 24	12
Operating Voltage:	Volts	10 – 14.5 & 20.5 – 29	10 – 14.5
Power Consumption:	Watts	@ 12 Volts	
Start		85	
Boost		90	
Controlled Range:	From	12	
	To	85	
Permissible Ambient Temp.	°F (°C)		
During Operation:	Heater	– 40... +104 (– 40... +40)	– 40... +68 (– 40... +20)
	Fuel Pump	– 40... +68 (– 40... +20)	– 40... +68 (– 40... +20)
Maximum Permissible Heating Air Inlet Temp. During Operation	°F (°C)	+104 (+40)	
Hot Air Flow - Unrestricted:	cfm (m³/h)		
	Boost	128 (218)	
Controlled Range:	From	81 (138)	
	To	128 (218)	
Permissible Storage Temp.	°F (°C)		
	Heater	– 40... +185 (– 40... +85)	
	Fuel Pump	– 40... +185 (– 40... +85)	
CO2 in Exhaust at Max. Output Permissible Operating Range	% by Volume	9.5... 12	9.5... 10.5
Noise	dBA		
Controlled Range:	From	45	
	To	58	
Weight of Heater	lb (kg)	13.2 (6.0)	

Table 4-1: Technical Data - Air Top 5000

4.2 Dimensions

The mounting dimensions as well as the space required for the performance of servicing work are shown in figure 4-1.



Dimensions expressed in millimeters

1 Heating air inlet
2 Heating air outlet
3 Combustion air inlet
4 Exhaust gas outlet
5 Fuel inlet
6 Min. space required for heating air inlet (1.77 in.)
7 Min. space required for heating air outlet (3.14 in.)
8 Min. space required for removal of heater (7.89 in.)
9 Electrical cable outlet (optionally on right or left)

Fig. 4-1: Dimensions - Air Top 5000

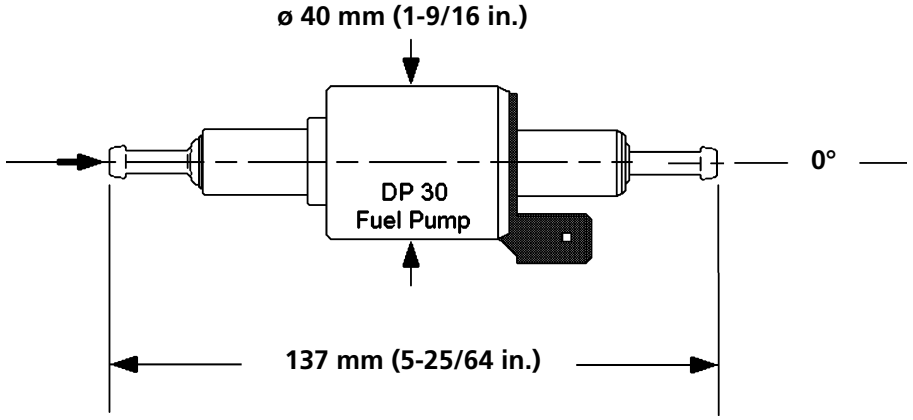


Fig. 4-2: Fuel Pump - Air Top 5000

ATTENTION!

Webasto recommends installing gasoline-operated heaters so that the exhaust gas outlet points vertically down. Other installation positions may cause increased wear to the burner.

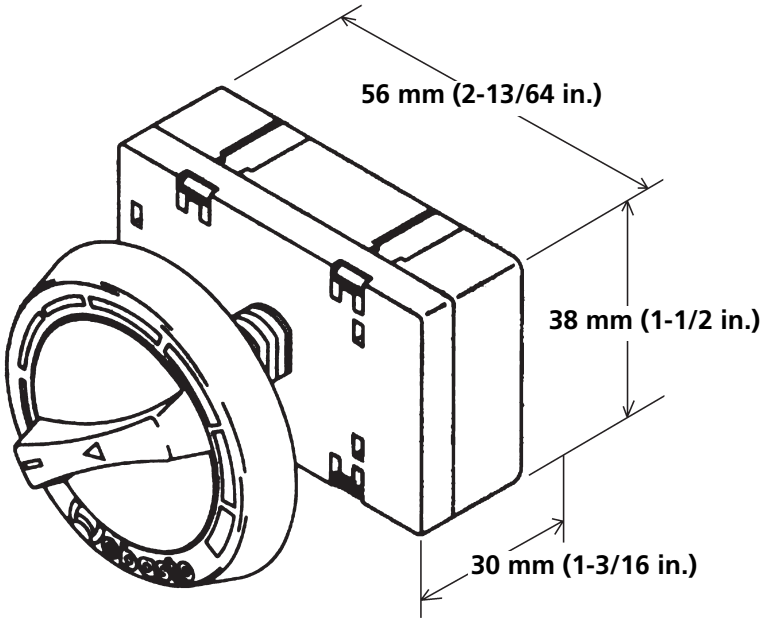


Fig. 4-3: Control Element (Rheostat) - Air Top 2000 / 3500 / 5000

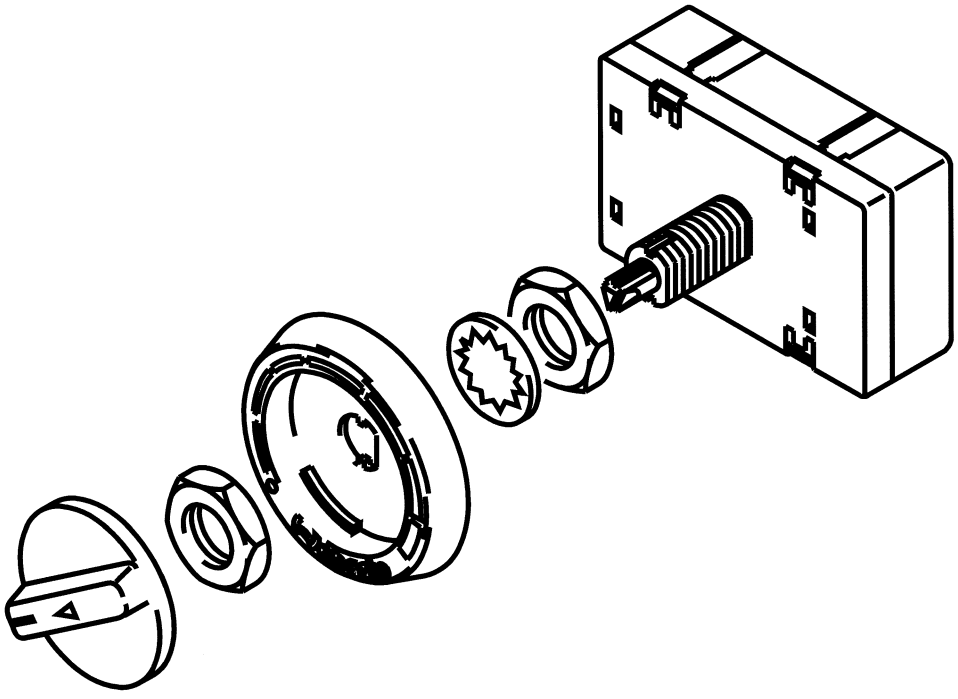


Fig. 4-4: Control Element (Rheostat) - Exploded View

5. Installation

5.1 General Information

This manual will guide you through the installation procedures necessary to ensure successful, reliable operation of the Air Top 5000 heater for years to come.

Carefully read all instructions and special notations before beginning the installation process.

The installation must be performed in accordance with the installation instructions provided in this manual.

⚠WARNING

Due to the confined spaces within marine vehicles, an increased risk of carbon monoxide poisoning causing death or serious injury to personnel is possible. Therefore, installations in marine vessels are to be performed by Webasto authorized marine equipment specialists only. It is the marine dealer's responsibility that the installation complies with all applicable Coast Guard regulations. Contact Webasto Product North America, Inc. at 1-800-555-4518 for a listing of authorized marine dealers.

⚠CAUTION

The different vehicle-specific installation conditions should be taken into account. The installation instructions within this manual are intended for basic installations in common over-the-road vehicles. The installation instructions within this manual are intended to be used as general installation guidelines only. For information concerning special applications or applications you are not sure of, contact an authorized Webasto dealer/distributor or Webasto Product North America, Inc. directly at 1-800-555-4518 (USA) or 1-800-667-8900 (Canada).

5.2 Installation Location

The heater should be installed in the vehicle's interior (with the exception of buses, see section 1 Introduction). If the heater is installed in an installation housing, such housing must be of a Webasto-approved design.

When installed in the vehicle's interior, the lead-through openings for combustion air inlet, exhaust gas outlet and fuel line must be splash-water protected. For this purpose, the special gasket supplied with the heater must be used. The gasket must be renewed prior to each re-installation.

The heater should be located in or as close as possible to the area being heated. This is acceptable provided the following criteria is observed and adhered to:

1. Exhaust, combustion air intake and fuel connections must be located outside of the vehicle's interior.
2. The heater must be mounted on a flat surface to provide an air-tight seal between the heater, gasket and vehicle or cargo / containment area.
3. Where the heater must be mounted outside of the vehicle's interior, a splash proof housing must be provided.

When selecting a location for the heater, consider the following:

1. Sufficient space for heating air inlet and outlet ducting. Preferably, where it cannot be damaged during normal use.
2. Combustion air and exhaust location, specifically, clearance around subfloor cross-members and structures, heat sensitive components and impediments to proper routing of tubes.
3. Fuel line connections and routing.
4. Control / power harness routing.
5. Access to the heater for seasonal maintenance and servicing (see figure 4-1).

5.3 Mounting the Air Top 5000 Heater

A mounting template has been included with the heater kit. The template details all required hole locations and clearances for ducting. Also, check for clearance around subfloor cross-members, structures and heat sensitive components before proceeding with installation.

Preferably, the heater should be mounted as close as possible to the room or compartment to be heated. The heater must be protected from the environment and, if necessary, mounted in an enclosure.

The heater is to be installed on a flat surface, utilizing either mounting arrangement as shown in figure 5-2 "Basic Kit" or figure 5-3 "Optional Mounting Plate". Access to the heater must not be obstructed. The space requirements in figure 4-1 for heater maintenance must be adhered to.

For mounting hole locations of all other kits where the mounting plate is not utilized, see figure 5-2.

The specified horizontal and axial angles of inclination must not be exceeded (see figure 5-1).

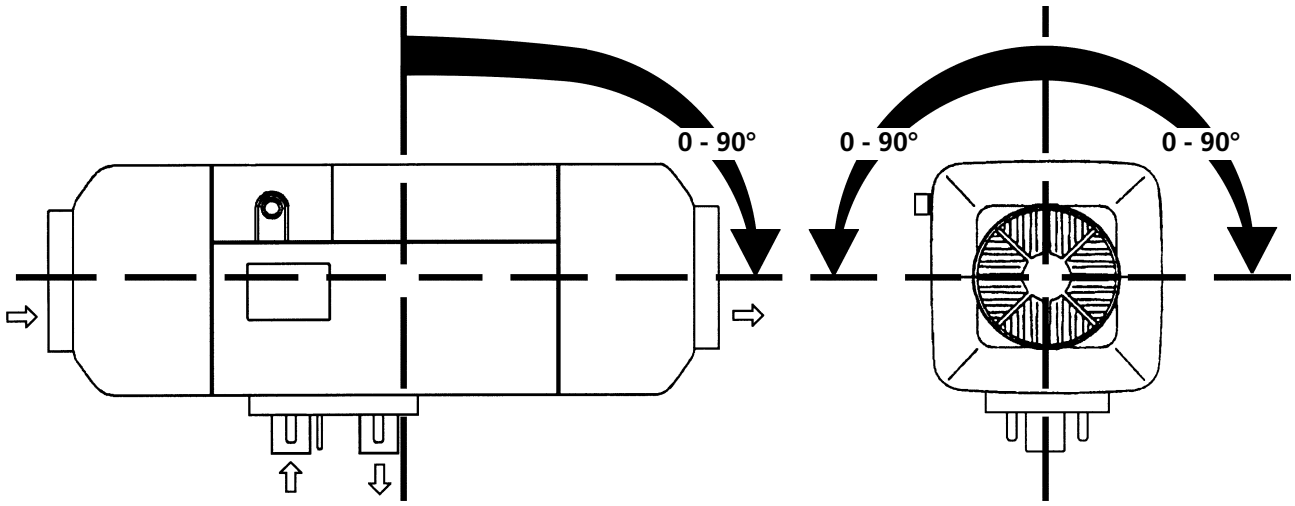


Fig. 5-1: Permissible Installation Position

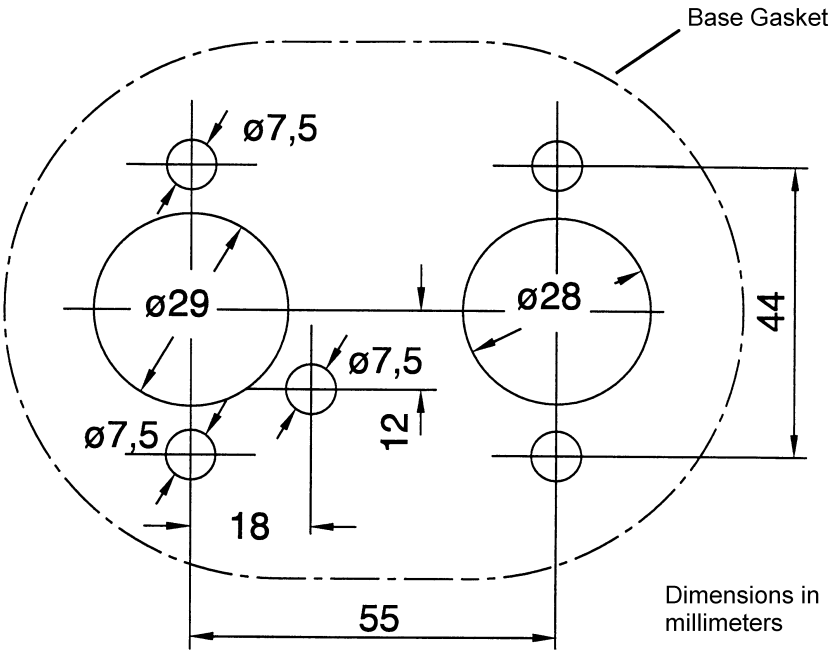


Fig. 5-2: Mounting Base Pattern - Basic Kit (Not to scale)

Basic Kit Installation

After selecting the heater location, temporarily tape the provided template in place and center punch hole locations for drilling or use the rubber base gasket of the heater as a template to map out hole locations.. With a hole saw, cut the 29 mm (1.14 in.) and 28 mm (1.1 in.) holes as shown. Drill the 5 remaining 7.5 mm (0.295 in.) mounting holes.

1. Position heater with rubber gasket over mounting holes and secure with fasteners provided.
2. Install combustion air tube, exhaust tube and fuel line from underside of vehicle.

ATTENTION!

Plan, measure and cut holes carefully!. Precision is extremely important in this mounting configuration.

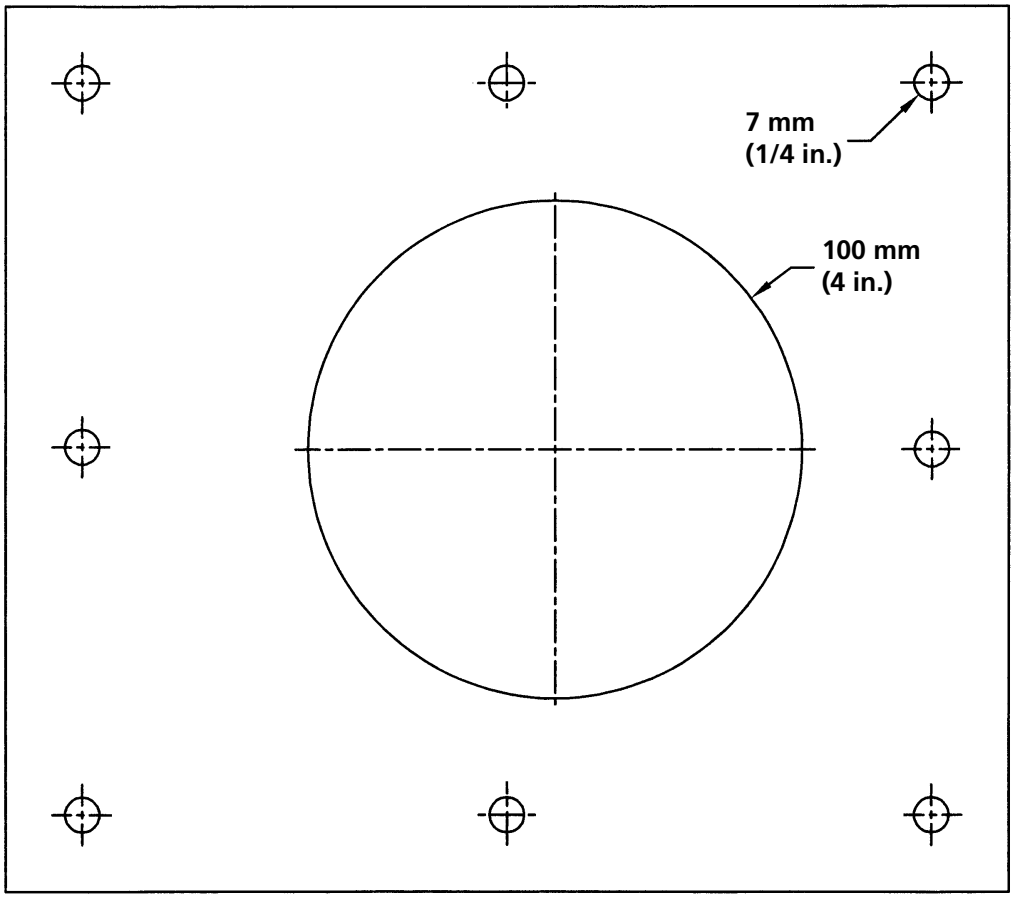


Fig. 5-3: Optional Mounting Plate - Not to Scale.

Optional Mounting Plate

After selecting the heater location, use the template provided with kit and cut the center hole 100 mm (4" in. dia.) with a hole saw or jig saw. Using the template, drill 8 holes 7 mm (1/4 in. dia.) for securing the mounting plate to the floor.

For ease of installation, now is a good time to make the fuel, exhaust and combustion air connections at the base of the heater. With the fuel line, exhaust and air intake attached, position and center the heater over the mounting hole and secure with the hardware provided.

⚠CAUTION

Do not over-tighten mounting fasteners! Doing so will distort mounting plate and heater which may result in fan motor failure. Tighten mounting fasteners sufficiently to make an air-tight seal between the heater base and floor. Ensure that the heater base with gasket cover the entire hole.

5.4 Exhaust System

⚠WARNING

Due to the risk of carbon monoxide poisoning causing death or serious injury to personnel, the exhaust tube must be so routed that the possibility of exhaust gases entering the vehicle / cargo area is avoided.

⚠CAUTION

The exhaust tube becomes hot during operation. Keep exhaust tube a minimum of 50 mm (2 in.) from heat sensitive components and materials.

⚠CAUTION

The exhaust tube must be so routed that the possibility of exhaust gases being drawn into the combustion air intake tube is avoided.

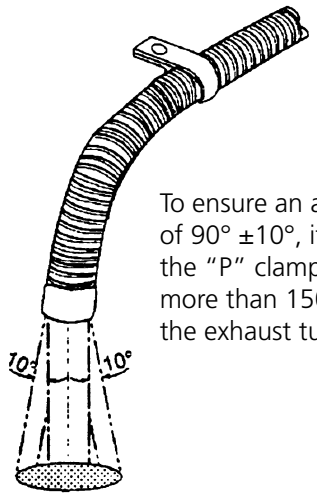
One meter (39 in.) of flexible metal exhaust tubing is provided in the installation kit for routing exhaust gases away from the underside of the vehicle or cargo / containment area.

1. Secure the exhaust tube to the heater with the clamp provided.
2. Route the exhaust tube in such a way as to prevent it from touching or being directed toward any part of the vehicle that may be damaged by heat (i.e. brake lines, electrical wiring, hoses). Always route exhaust tube in a slight downward pitch away from the heater to allow condensation to drain. If dips or bends cannot be avoided, drill a 5 mm (3/16 in.) hole at the lowest point of each bend or dip to allow drainage of condensation (see figure 5-5).
3. Bend outlet end of tube in a downward direction (see figure 5-4). Do not point outlet in direction of travel. Do not direct towards heat sensitive components and materials such as brake lines, electrical wiring, hoses, tires, etc. Locate exhaust tube outlet where the possibility of clogging by snow, mud or debris can be avoided.
4. Secure exhaust tube in place with "P" clamp provided.

NEVER ROUTE EXHAUST TUBE IN THE DIRECTION OF TRAVEL.

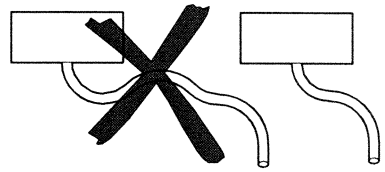
ATTENTION!

Installations where longer lengths of exhaust tubing are required, do not exceed 2 meters (6 feet) in length. Rigid exhaust tubing (minimum wall thickness - 1 mm) may be used in place of flexible tubing. All bends are to be of a smooth radius style. Mitered and welded bends are not permitted. Minimum bending radius for both flexible and rigid tubes is 45 mm (1-3/4 in.). Bends in the exhaust tubing must not exceed 270° total.

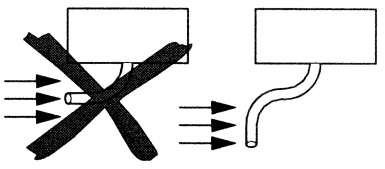


To ensure an angle of discharge of 90° ±10°, it is required that the "P" clamp be attached no more than 150 mm (6 in.) from the exhaust tube end.

Fig. 5-4: Exhaust Tube Outlet Position



Prevent condensation from forming



Tubes must not point in direction of travel

Fig. 5-5: Combustion Air/Exhaust Tube Routing

5.5 Combustion Air Supply

⚠WARNING

Due to the risk of carbon monoxide poisoning causing death or serious injury to personnel, never draw combustion air from inside of the cab, passenger area or cargo area of any vehicle where personnel are likely to be present.
Drawing combustion air from inside of the cab, passenger area or cargo area of any vehicle can create a negative interior pressure which may allow exhaust gases in the immediate area outside the vehicle to seep in, gradually displacing oxygen with poisonous carbon monoxide.

One half meter (19.5 in.) of flexible combustion air intake tubing is provided in the installation kit for routing combustion air into the heater.

1. Secure the combustion air intake tube to the heater with the gear clamp provided.
2. Route the combustion tube to an area where it is protected from splash water and not likely to be clogged by snow, mud or debris. Always route intake tube in a slight downward pitch away from the heater to allow moisture to drain. If dips or bends cannot be avoided, drill a 5 mm (3/16 in.) hole at the lowest point of each bend or dip to allow drainage of moisture (see figure 5-5).
3. Bend inlet end of tube in a downward direction (see figure 5-5). Do not point into the direction of travel.
4. Secure combustion air intake tube to the vehicle with nylon wire ties where possible.

NEVER ROUTE COMBUSTION TUBE IN THE DIRECTION OF TRAVEL.

ATTENTION!

Installations where longer lengths of combustion air tubing are required, do not exceed 2 meters (6 feet) in length. Minimum bending radius is 45 mm (1-3/4 in.). Bends in the combustion air intake tubing must not exceed 270° total.

5.6 Fuel System

5.6.1 General Information

The fuel metering pump, fuel line and fuel standpipe together are integral to the heating systems reliability and performance. Install in accordance with the instructions detailed within this section.

5.6.2 Fuel System Limits

NOTE: The fuel pump must not be mounted lower than 500 mm (20 in.) below the top of the fuel tank.

Maximum suction height (A) = 1 m (39 in.)
Maximum suction length (A + B) = 2 m (78 in.)
Maximum delivery length (C + D) = 6 m (234 in.)
Maximum delivery height (D) = 3 m (117 in.)

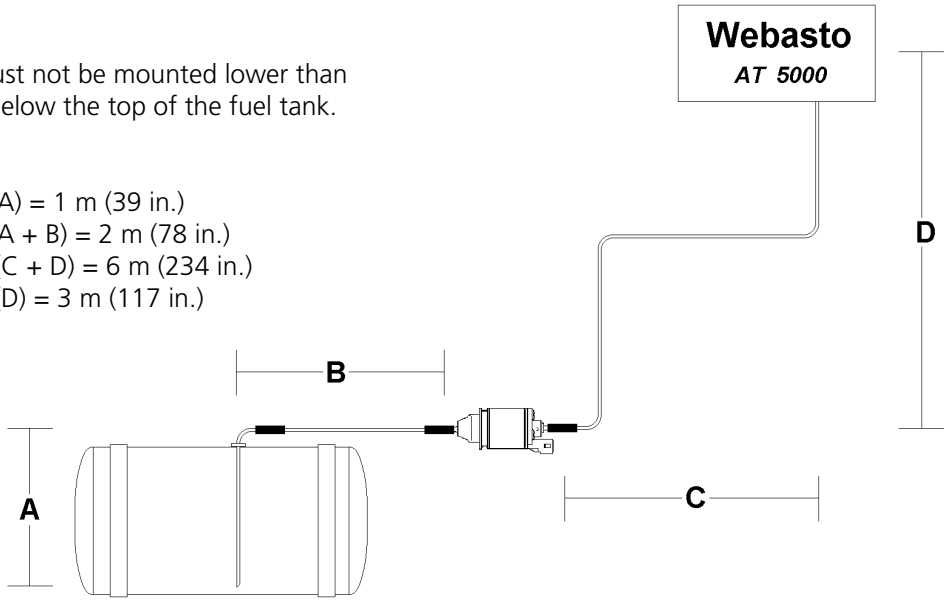


Fig. 5-6: Fuel System Limits

5.6.3 Fuel Standpipe

⚠WARNING

Due to the risk of fire or explosion causing death or serious injury to personnel, extreme care must be exercised when working with gasoline fueled vehicles. Gasoline tanks must never be drilled until first emptied and properly purged of all remaining gasoline and fumes.

Fuel is drawn from the vehicle's fuel tank through the use of a standpipe provided in the heater installation kit.

The fuel standpipe can be used on fuel tanks with a spare threaded port. If a spare threaded port is not available, a 25 mm (1 in.) hole can be punched or drilled into the fuel tank or spare fuel level sending unit plate and the universal tank-boss installed as shown in figure 5-7.

The fuel standpipe should be kept 50 mm (2 in.) off the bottom of the fuel tank to prevent drawing sediment and water into the heaters fuel system.

Fuel Standpipe Installation:

1. Cut fuel standpipe to length, approx. 50 mm (2 in.) off bottom of fuel tank. Angle the cut to prevent clogging. Remove burrs from cut end. Apply thread sealant to threaded fittings to prevent fuel leaks.
2. Install fuel standpipe using one of the following methods
   - use 1/4 or 1/2 spare port on top of fuel tank (if available) and install standpipe

   OR
   - drill or punch a 25 mm (1 in.) hole in a clear area on top of the fuel tank or spare fuel level sending unit plate.
   - assemble tank-boss and fuel standpipe to form single unit.
   - install standpipe by angling unit in so that one ear of the tank-boss hooks under the edge of the hole. Repeat with the other ear in the same fashion.
3. Center in hole and clamp in place by tightening the nut down until the gasket begins to squeeze out slightly.

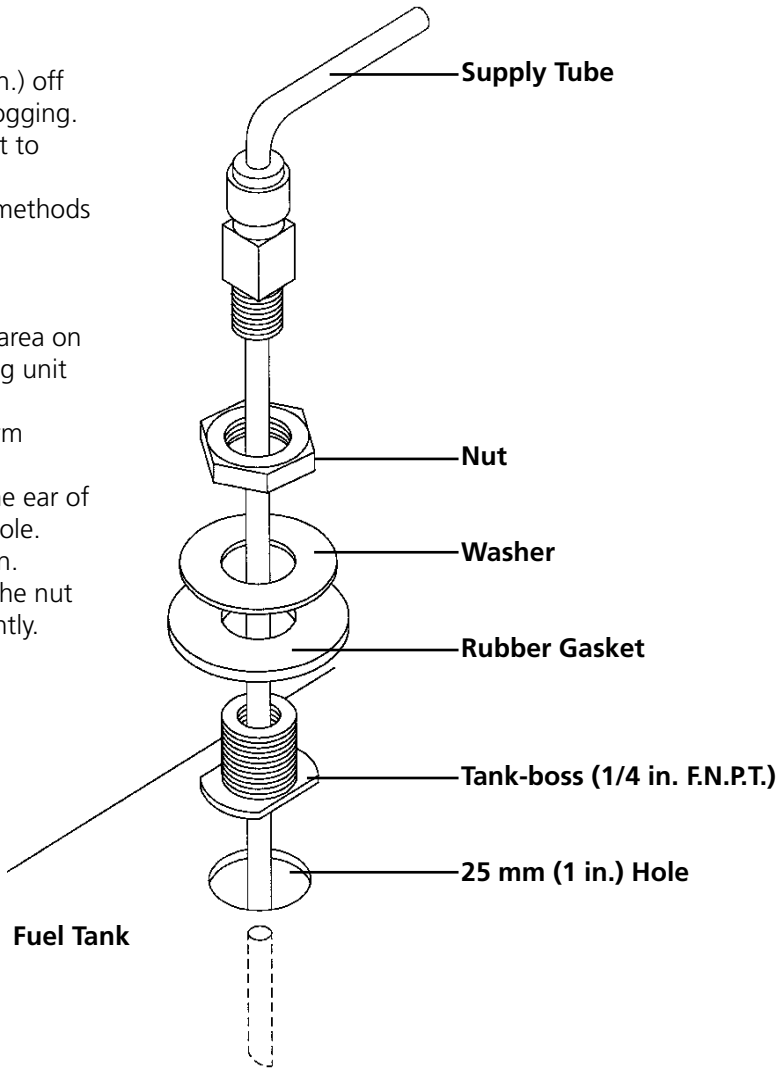


Fig. 5-7: Fuel Standpipe

5.6.4 Fuel Metering Pump

The fuel metering pump forms a combined delivery/metering and shutoff system and is subject to certain installation criteria (see figures 5-6, 5-8 and 5-9).

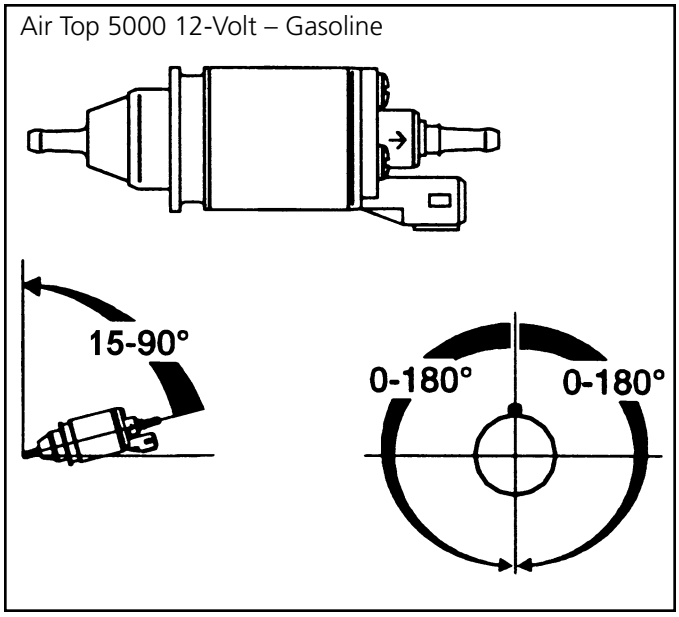


Fig. 5-8: Metering Pump DP 2
Installation Position and Mounting

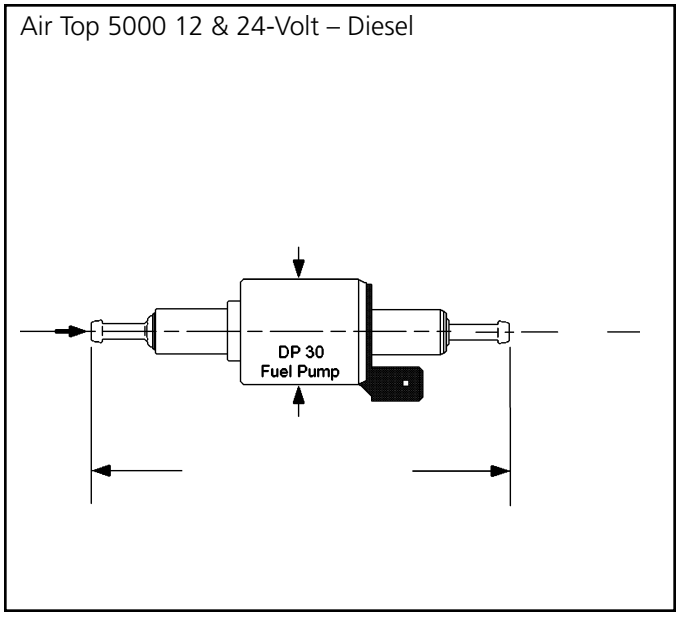


Fig. 5-9: Metering Pump DP 30
Installation Position and Mounting

It is recommended that the metering pump be installed in a cool location. The permissible ambient temperature must not exceed a temperature of + 20 °C (68 °F) at any time during operation.

Mount fuel pump within 1 m (39 in.) of the heater for electrical harness connection. If it is not possible to mount the pump within this distance, an optional extension harness is available under part number 905781A.

Metering pump and fuel lines must not be mounted within the radiation range of hot vehicle parts. If necessary, a heat shield should be installed.

The metering pump is to be attached by a vibration-damping suspension device (rubber isolated clamp). The installation position is restricted as shown in figures 5-8 and 5-9 in order to ensure proper operation and self-bleeding of the system.

To minimize the occurrence of corrosion, only genuine Webasto parts are to be used for the plug connection between the metering pump and the metering pump cable harness.

5.6.5 Fuel Line

Fuel line, couplers and clamps are provided in the installation kit and MUST be used.

ATTENTION!
When cutting fuel line to length, ALWAYS use a sharp razor knife or blade. Never cut fuel line with side cutters or similar tools as they will crimp the line closed.

The Air Top 5000 heater uses fuel line that meets specific criteria for proper function and reliable operation. The inside diameter of this fuel line is 2.0 mm (0.08 in.) and must never be substituted with fuel line of a larger inside diameter. Doing so will adversely affect the heaters performance and reliability.

Fuel line connections must be made using the couplers and clamps provided and as shown in figure 5-10.

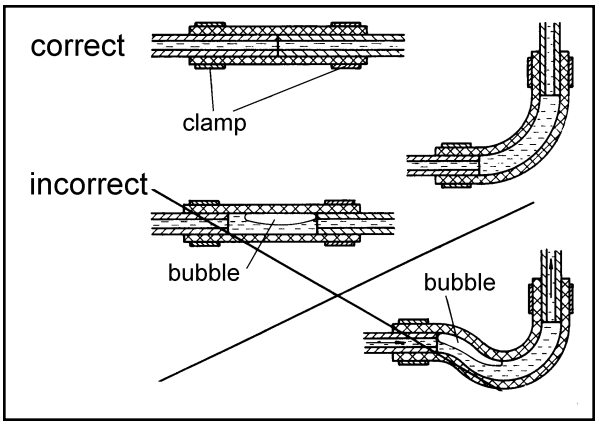


Fig. 5-10: Fuel Line Connection

Connect fuel line from fuel standpipe to fuel metering pump inlet and from fuel metering pump outlet to the inlet port of the heater using supplied rubber connectors and clamps. Tie fuel line in place every 305 mm (12 in.).

⚠CAUTION

Fuel lines must be secured to the vehicle every 305 mm (12 in.) and routed away from hot exhaust components and moving parts (drive shaft, wheels, etc.).

ATTENTION!

A Fuel line and fuel metering pump harness kit is available for extending the fuel system in the case of cab-over vehicles. Order P/N 905555.

5.6.6 Fuel Filter

A fuel filter may be supplied with your heater depending on kit model and application.

If the heater kit being installed does not include a fuel filter and dirt in the fuel cannot be avoided or is expected, an optional filter is available from Webasto. Order genuine Webasto fuel filter P/N 487171. The filter should preferably be installed in a vertical position, where this is not possible, it may also be installed horizontally (see figure 5-11). The fuel filter can be installed anywhere accessible between the fuel standpipe and the fuel metering pump inlet (direction of flow to be observed) .

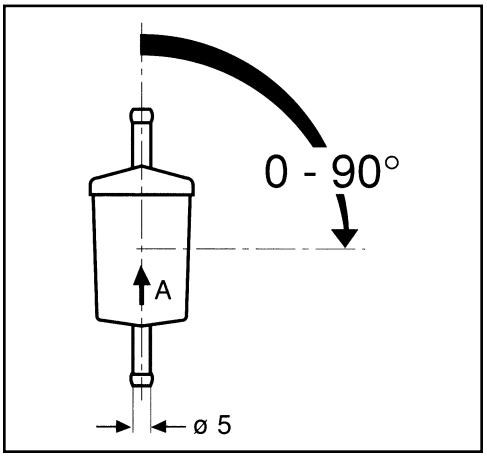


Fig. 5-11: Fuel Filter Position

Fuel filters should be replaced at least annually and in the case of dirty fuel, more often. Always replace with a genuine Webasto fuel filter P/N 487171.

5.7 Wiring Connections

5.7.1 General Information

The Air Top 5000 heater may be operated using the standard rheostat switch or with the optional 7-Day digital "Combi" Timer model 1531. The following section shows the possible circuits with the standard rheostat switch installed.

5.7.2 Connector Identification

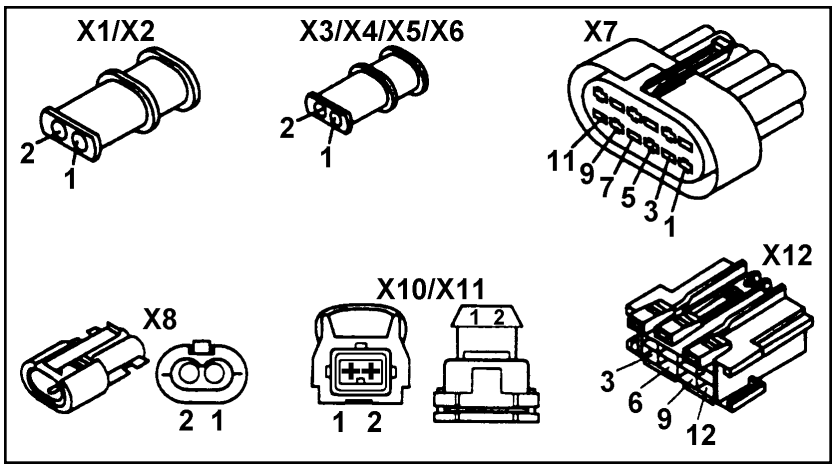


Fig. 5-12: Connector Identification

ITEM	DESCRIPTION
X1	Blower Motor
X2	Ceramic Igniter / Flame Detector
X3	Temperature Limiter
X4	Fuel Pump
X5	Temperature Sensor
X6	Not Used
X7	Main Harness Connection to Control Unit
X8	Diagnostic Link Connection (Key Word 2000 - PC Download System)
X9	Control Element (On - Off Switch and Temperature Controller or Combi Timer)
X10 - X11	Fuel Pump
X12	Not Used (Future Timer Connection Provision)

Table 5-1: Connector Identification

Refer to wiring diagram on page 5-10, figure 5-13.

5.7.3 Wiring Diagram - Air Top 5000, 12 and 24 Volt

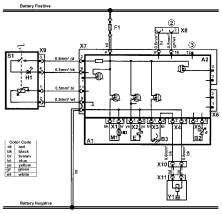


Fig. 5-13: Wiring Diagram - Air Top 5000

5.7.4 Electrical Component Identification Table

Table below refers to wiring diagram on page 5-10, figure 5-13.

ITEM	DESCRIPTION
A1	Heater - Air Top 5000
A2	Control Unit
B2	Temperature Sensor
B3	Temperature Limiter
E	Ceramic Igniter / Flame Detector
F1	Flat Fuse - 15 Amp
H1	Operation Indicator
M1	Fan Motor
S1	Control Element (On - Off Switch and Temperature Controller)
X1	2-pin Connector - Fan Motor
X2	2-pin Connector - Ceramic Igniter / Flame Detector
X3	2-pin Connector - Temperature Limiter
X4	2-pin Connector - Fuel Pump
X5	2-pin Connector - Temperature Sensor
X6	2-pin Connector - Not Used
X7	12-pin Connector - Main Harness Connection
X8	2-pin Connector - Diagnostic Link
X9	4-pin Connector - Control Element
X10	2-pin Connector - Fuel Pump Harness
X11	2-pin Connector - Fuel Pump Harness
Y1	Fuel Dosing Pump

Table 5-2: Electrical Component Identification

5.8 Control Element Installation

Mount the control element as illustrated in figures 5-14 and 5-15. Observe dimensions in figure 5-18.

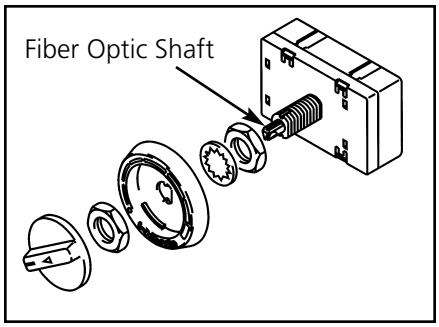


Fig. 5-14: Control Element

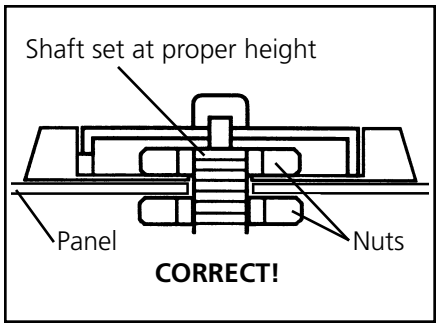


Fig. 5-15: Control Element Knob Correctly Installed

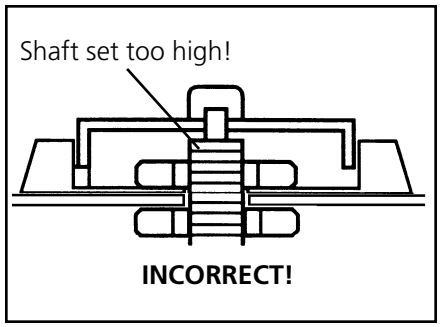


Fig. 5-16: Control Element Knob Incorrectly Installed!

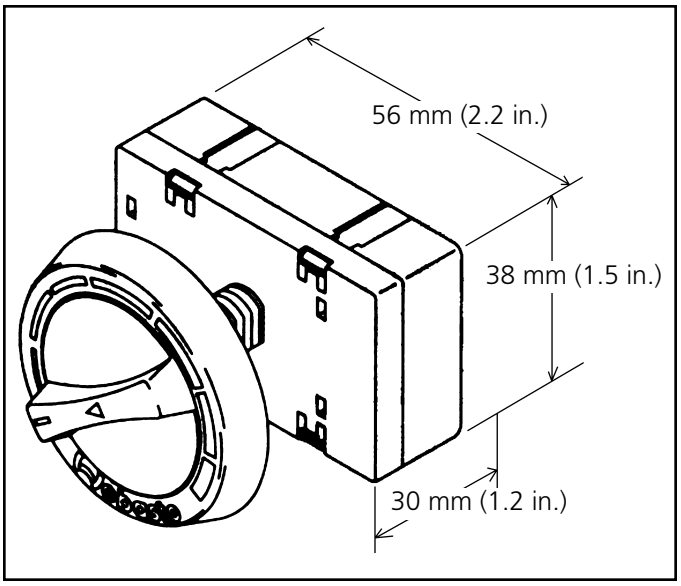


Fig. 5-17: Control Element Dimensions

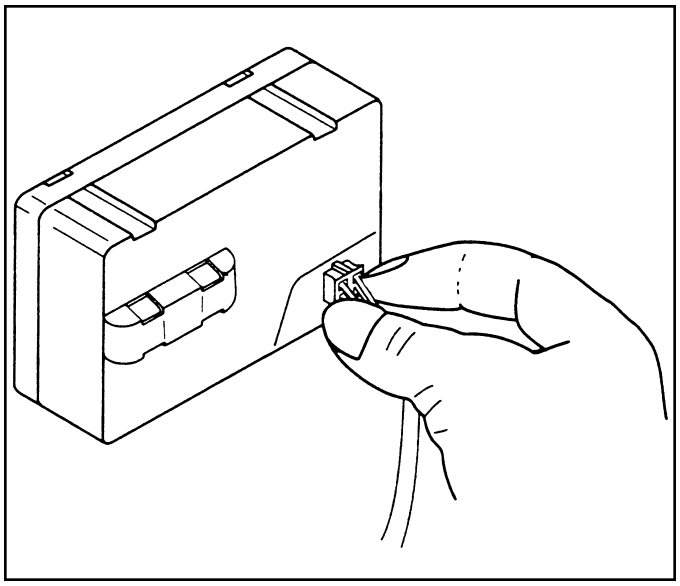


Fig. 5-18: Control Element Harness Plug

The heater control harness must be plugged into the back of the control element as illustrated in figure 5-18.

Allow enough slack in the harness so that it is not stretched taut. Do not pull on wires!

5.8.1 Fuel Metering Pump Harness

Connect the fuel metering pump harness (located on the underside of the heater) to the fuel pump. Harness connector will "click" into place when properly inserted.

On cab-over vehicles, an extension harness may be required. The extension harness connects between the heater harness and the fuel metering pump.

ATTENTION!

A Fuel line and fuel metering pump harness kit is available for extending the fuel system in the case of cab-over vehicles. Order P/N 905555.

5.8.2 Remote Temperature Sensor (Optional)

A remote external temperature sensor kit (includes updated control unit) is available from Webasto under part number 90821A. The remote sensor allows temperature monitoring from a remote location other than the heaters inlet. This is beneficial where the heater is located in an area where cold air influx does not allow consistent temperature measurement at the heater inlet.
The internal temperature sensor must be removed prior to the installation of the external sensor kit.

Installation:

The external temperature sensor must be mounted in the vehicle at mid-height on surfaces as vertical as possible.

The temperature sensor must not be located directly in the hot air stream (vehicle's or heaters heating air).

The temperature sensor must not be mounted in the vicinity of heat sources (e.g. vehicle's heating system).

The temperature sensor must not be exposed to direct sun radiation.

The temperature sensor must not be mounted behind curtains or partitions out of the reach of heated air.

5.9 Ducting the System

⚠WARNING

Due to the risk of fire or explosion causing death or serious injury to personnel, Webasto air heaters are not to be used for heating combustible, flammable and hazardous materials.

⚠WARNING

Never use materials that are not approved for heat ducting systems such as PVC or similar materials as toxic off-gassing from these materials can occur.

⚠CAUTION

Due to the high heat output of the Air Top 5000, it is not permissible to integrate the heater into the vehicle's air ducting system. Doing so will result in melting damage to the vehicle's air ducting system.

⚠CAUTION

In vehicles designed for the transportation of passengers, the air outlet openings must be arranged in such a way that they cannot be obstructed by passengers.

⚠CAUTION

The heater outlet air temperature can reach 130 °C (266 °F). Do not point outlet towards heat sensitive material or personnel. Keep outlet at least 305 mm (12 in.) away from heat sensitive materials and personnel.

5.9.1 General Information

NOTE: Additional ducting components are available through Webasto distributors and dealers.

Where fresh air intake for heating is utilized, it must be installed so that under normal operating conditions exhaust gases from the vehicles engine or the heater can not be drawn into the vehicle / compartment being heated.

When short runs of ducting are used, it is sufficient to use 80 mm (3.14 in.) I.D. Ducting. The maximum ducting length on the heater should never exceed 15' (inlet and outlet combined) with no more than 270° total bends. The maximum pressure differential between the heaters air inlet and outlet is 1 in. water column (2.5 mbar). Exceeding this back pressure will result in a overheat condition and the heaters temperature limiter (overheat sensor) is likely to respond.

Air outlet ducting or opening and return air ducting or opening should be separated by at least 24 in. or more to allow proper temperature monitoring and consistency.

The integration of the heaters outlet into an existing vehicle or compartment ducting system is not permitted as over heating of the heater will likely occur. Secondly, due to the high heat output of the AT 5000 heater, damage to the vehicle or compartment ducting system is likely to occur.

Air inlet temperature to the heater must not exceed 104°F (40°C) or the temperature limiter is likely to respond. Restrictions at the heaters inlet and outlet i.e. paper, clutter, etc. will also contribute to overheating.

KEEP THE AIR INLET AND OUTLETS CLEAR OF OBSTRUCTIONS!

5.10 Initial Start Up

Before starting heater, check your installation for:

- routing and securing of wiring, fuel line, exhaust/combustion air tubes and hot air outlet/return air ducting.
- battery connections and polarity.
- loose fasteners.

Once the installation has been inspected, insert the main power fuse and set the control element knob to the full heat position (see figure 5-19).

Allow the heater to run through 2 start-up attempts. Watch the clear fuel line for indications of air bubbles and fuel. Depending on length of fuel line, it may take a few start attempts before the fuel reaches the heater. If the fuel line does not prime right away, switch heater off and back on to reinitiate the start-up cycle.

Once the heater starts, allow it to run until all trapped air bubbles have escaped and heater operation sounds smooth and consistent.

After the heater is in operation, all fuel connections must be checked for leakage and all lines/wiring for secure fastening.

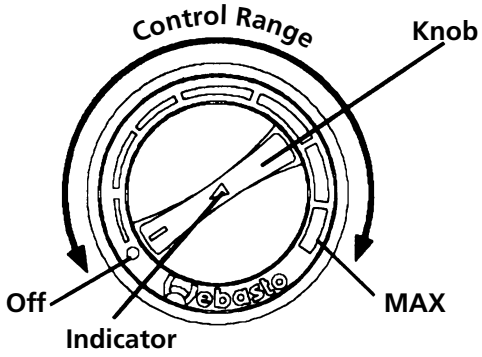


Fig. 5-19: Control Element Knob Range

Using the information from the heater identification plate, complete the warranty card and send to Webasto Thermosystems for warranty registration.

6. Maintenance/Troubleshooting

⚠WARNING

Although simple maintenance procedures can be performed by the owner, any operational problems, major repairs due to damage, subsequent installations or alterations must be performed by a properly trained Webasto specialist.

⚠CAUTIONS

Always use genuine Webasto service and replacement parts to ensure trouble-free operation of the heater.

6.1 Heater Maintenance

The Webasto Air Top 5000 heater is designed for minimal maintenance. Under normal circumstances it should be inspected for proper function at least once annually, perferrably, just prior to the heating season.

To ensure trouble-free operation, the following should be part of an annual and periodical inspection:

1. Operate the heater a minimum of 10 minutes every month to keep fresh fuel in the system and the fuel pump lubricated.
2. Keep the heating air outlet and ducting clear of obstructions. Inspect outlet ducting for damage and repair as necessary.
3. Keep the heater inlet grille clear of obstructions. If the heater is equipped with ducting, inspect for damage and repair as necessary.
4. Inspect the combustion air tube and exhaust tube for obstructions and damage. Check to ensure they are securely attached to the heater and vehicle. Repair damaged items where necessary.
5. Inspect the fuel system and all connections for leaks. Tighten clamps if loose. Ensure fuel line is well secured to the vehicle. Replace fuel filter if equipped.

6.2 Troubleshooting

Troubleshooting requires profound knowledge about structure and theory of operation of the heater components and should only be performed by authorized Webasto trained specialists.

For the purpose of this manual, only those items as they pertain to installation will be covered under troubleshooting. For malfunctional problems beyond the scope of this manual, please call Webasto Product North America, Inc. directly at 1-800-555-4518 (USA) or 1-800-667-8900 (Canada).

In the event of a heater malfunction, first check the following two items to eliminate them as cause for trouble:

A. Power Supply
   - Fuse blown?
   - Power at fuse?

B. Fuel Supply
   - Fuel in tank?
   - Clean, unrestricted fuel supply?

6.2.1 Heater Shuts Off Automatically

The heater will automatically shut off if a malfunction occurs. To clear a malfunction, turn control element knob to off, wait 2 seconds and turn on once again to reset the heaters control unit. Should the heater fail to start or continues to malfunction, consult your Webasto specialist.

6.2.2 Heater Emits Black Smoke from Exhaust

Check the combustion air intake tube and exhaust tube for obstructions or damage. Clear obstructions as necessary or replace damaged tubes. Should condition persist, consult your Webasto specialist.

6.2.3 Self-Diagnostic System (Reading Flash Codes)

A flash code will be generated on the indicator light of the control element or a code will be entered on the face of the optional 7-day timer. These codes indicate a malfunction and subsequent operational interruption. There are ten codes available depending on the nature of the malfunction (see table 6-1).

In order to make a correct analysis, it is necessary to understand the flash code event. The flash code pertains to the control element (switch) only. The flash code is only visible during the after-run (cool-down) period of operation (an optional timer will hold the last code in memory until corrected, see "F" codes in parentheses on table 6-1).

During the flash code event, you will see five quick flashes followed by a slower sequence of flashes from one flash to ten flashes. The slower sequence of flashes is the actual malfunction code. The five quick flashes are only an indication that a malfunction has been detected and that the code will be displayed. Count only the slower sequence of flashes to obtain the current malfunction code.

For example (◎ = one flash):
Event code 4X (F 04): ◎◎◎◎◎ .... ◎ .... ◎ .... ◎ .... ◎

The fast/slow sequence will be repeated until the heater completes the after-run (cool-down) cycle after which, the code will be stored in the control unit memory.

Storing a Fault Code in Memory

Once the Air Top 5000 heater completes the after run (cool down) period initiated by a failure event, the current flash code will be downloaded (stored) in memory. The Air Top 5000 heater can store up to four fault codes. Once the memory is "full", any additional fault code will replace the earliest code stored thereby continually updating the fault codes stored in memory with the four most recent faults.

Reading and Removing Fault Codes Stored in Memory

It is possible to read and remove (reset) stored fault codes from the Air Top 5000 heater memory. This is achieved through the use of a diagnostic interface kit connected to the Air Top 5000 heater and an PC compatible computer which has the necessary software installed.

In addition to working with stored fault codes, the PC Diagnostic Interface Kit allows you to do several other functions such as reading values while the heater is in operation or testing individual components. Printing out of fault codes is also available (User supplied printer required).

For more information about the PC Diagnostic Interface Kit, please consult your Webasto specialist.

ATTENTION!
Specialized diagnostic equipment is required to read malfunction codes stored in the control unit memory. Consult your Webasto specialist for details.

ATTENTION!
After any correction of a malfunction, a functional test has to be performed with the heater installed in the vehicle.

ATTENTION!
Ambient air temperature must be below the set point on the control element knob before heater will start operation.

6.2.4 Diagnostic Code Table

Symptom	Probable Cause	Check and Correct
No Function	Electrical wiring, fuses Control unit	Fuses Battery connections Power at red wire and ground at heater brown wire Consult your Webasto specialist
1X Flash (F 01) No combustion achieved after start and repeat start	Fuel system Combustion air Burner	Fuel level - No fuel - Fuel system not primed Type of fuel being used Plugged fuel filter - replace Fuel line connections and clamps (air bubbles in fuel lines) Air intake or exhaust - restricted or plugged Clean or replace burner unit
2X Flashes (F 02) Flame-out during operation	Fuel supply (shortage) Burner	Restriction in fuel system Plugged fuel filter - replace Fuel line connections and clamps (air bubbles in fuel lines) Type of fuel being used Clean or replace burner unit
3X Flashes (F 03) Low voltage for more than 20 seconds	Electrical system	Load test batteries Corrosion at connections Loose connections
4X Flashes (F 04) Flame sensor permanently hot	Defective flame sensor	Replace flame sensor
6X Flashes (F 06) Temperature sensor	Wiring Defective temp. sensor	Damaged or corroded wiring, open or short circuit Replace temperature sensor
7X Flashes (F 07) Fuel metering pump	Wiring Defective fuel pump	Damaged or corroded wiring, open or short circuit Replace fuel pump
8X Flashes (F 08) Combustion air fan	Wiring Wrong RPM Defective fan motor	Damaged or corroded wiring, open or short circuit Replace combustion air fan motor Replace combustion air fan motor
9X Flashes (F 09) Ceramic igniter (glow pin)	Wiring Defective igniter	Damaged or corroded wiring, open or short circuit Replace ceramic igniter
10X Flashes (F 10) Temperature limiter	Overheat condition Air flow Wiring Defective limiter	Switch heater off and back on (see air flow) Motor/fan obstruction, heating air flow blocked Damaged or corroded wiring, open or short circuit Replace temperature limiter
12X Flashes (F 12) Control Element (Temperature Controller)	Wiring Defective controller	Interruption or short circuit Replace control element

Table 6-1: Diagnostic Codes - Air Top 5000 Diagnostic

Please use this section for your notes and observations.